Sustainable Natural Resource Management to Ensure Strategic Environmental Development

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Abstract **– The article reveals the issue of irrational use of natural resources in Ukraine that affects public health, population working ability and macroeconomic performance. It has been found that heavier responsibility of each individual and changes in values can improve the current situation. It is concluded that the general utility function can be increased by rational nature management and implementation of the development strategy minimizing such negative risk factors as ecological state deterioration, inefficient functioning of the healthcare system, excessive use of chemical compounds while producing agricultural products, etc. The key in the study is the formation of a holistic view of the relationship between pollution and the state of the environment and harm to public health based on the analysis of rational nature management and environmental pollution and their negative impact on environmental health. A model has been developed that takes into account the negative environmental impact on health and the investment that is necessary to be healthy and stay productive.**

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1. Introduction

Environmental management is one of the core social goals that can advance living standards and ecosystem conditions in case of the well-elaborated strategy for further actions, which is one of the most important environmental healthcare problems. There are many publications on this topic, however, the problem has not yet been resolved, and in Ukraine it is constantly becoming stronger and larger. Monitoring and analysis of human and environmental interaction is a background information for making managerial decisions during the initiation of green economy being implemented in leading countries in the 21st century. To increase a social and economic effect of production, one should constantly control external environment and minimize risks, which is impossible without adopting a system for the sustainable use of natural resources [1]. As the environment has its limits and short supplies while the target function of manufacturing includes the more efficient application of available resources, steady ecosystem preservation can be considered as an optimization problem.

The environment is healthy and stress-free if it is stable and resilient, that is, if it is active and maintains its organization and autonomy over time and is resistant to stress, whereas in Ukraine we are seeing environmental degradation [2].

Planning and forecasting in the environment preservation sector are able to provide population food safety, encourage stabilization of economic environment and increase the quality of surrounding environment. The implementation of external environment management requires new principles of state and public environmental protection management, legislative changes, changes in

population's mentality and attitude to the ecosystem; a complex approach to the solution of natural management and environmental safety issues; investigation of regional features as well as the keeping of features and historically formed landscapes; allocation of administrative, exploitation and oversight functions while organizing the activity of dedicated government agencies. All changes in Ukraine are interrelated and interdependent in a particular way, as well as transform the ecosystem. The economic activity process is accompanied by contradictions of the implementation of the circular economy model while solving ecological problems in the current period and for the future, which are generally related to the desire to maximize profit as fast as possible by worsening the environmental state, which poses a growing threat to public health and the well-being of the society. Efficiency improvement of production activity management should be conducted along with changes in the governing body structure. One has been extensively developing approaches to natural management economics aimed at combining and systematizing ecological policy tools within the past decade.

Ukraine can consider the Republic of South Africa as an example of establishment of rational nature management. Besides innovations, South Africa was transforming the legislative system where each economic entity was responsible for the environmental condition and impact on it, as well as could face a penalty in case of law violation and could obtain a money reward for information about the irrational use of natural resources by other economic entity. Apart from the penalty scheme, a violator should eliminate the reason for the worsened ecosystem condition and neutralize all negative consequences.

In modern conditions, the policy to reduce environmental pollution in Ukraine does not take into account the negative consequences on the health of the population, which requires an assessment of the impact of not only each specific pollution factor, but also a generalized analysis of the relationship between these factors and environmental health. Therefore, the key in the study will be to form a holistic view of the relationship between pollution and environmental conditions and harm to public health based on the analysis of rational nature management and environmental pollution and their negative impact on healthcare.

The main objective of the article is to form a model that would take into account the development of the surrounding environment, the impact of the ecosystem on human health, since people form the labour potential of the country.

The strategic development of health care must take into account environmental risks and threats to health and ensure a safe environment through the rational use of resources. Within the framework of this study, natural resource management is considered as the basis for the impact on health status through environmental changes and socio-economic development [3].

Approaches to environmental management laid the foundation for health development, but they were insufficient to reduce environmental threats to health, which explains the need for strategic development of health care based on sustainable models for the use of natural resources and waste recycling, which will contribute to an increase in economic activities. The irrational use of natural resources increases not only the costs of the state to reduce the impact of irrational use of resources on the welfare of the population, but also incurs losses associated with the impact on ecosystems on human productivity.

There are many experiments in Ukraine, however, there is no formalized model that would be introduced into reality and started to be used that has explored the key tools for influencing natural resource management. It has transpired that a large percentage of Ukrainian shadow economy slows down the implementation of rational nature management, creating additional risk factors for the population and worsening the life quality in conditions of low implementation of Greentech.

2. Literature Review

The problem of sustainable management of natural resources has been approached from the perspective of a problem related to natural resources and their partial impact on environmental health, which was characterized by a high degree of scientific uncertainty [4].

Over the recent years, there has been a wide application of such terms as green finances and green bonds aimed at financing ecological projects. Erum and Hussain [5] mention that rational nature management affects and encourages the economic growth of countries while developing countries have a high level of corruption that slows down the development and shift to green technologies.

Sikor, He and Lestrelin [6] conclude that the outcome of rational nature management adoption depends on tools for property entity management and property rights, which are different in every country. Local communities and local government bodies play a significant role nowadays while the state should ensure legal compliance with ecological legislation and superiority of green technologies over resource-intensive and ecologically dangerous ones.

In [7], [8] studied the detailed comparative dynamics of processes in nature and society, presented in the form of time series and the presence of links between external influences on humans and morbidity is necessary.

Without identifying such links, it is hardly possible to correctly understand, predict and prevent possible potential dangers from external influences and anthropogenic influences, and in case of their occurrence – to respond to them correctly.

Nawaz, Lahiani and Roubaud [9] state in their works that the financial development, natural resources, capital, labour and economic growth encourage long-term association and consolidation. Besides, the financial development enhances internal manufacturing and expenses for environmental protection measures, resulting in the economic growth. Therefore, we can see the integration of green technologies in advanced countries and extensive evolution methods in developing countries.

Asif, Khan, Anser, Nassani, Abro and Zaman [10] stress that an important role in the establishment of rational nature management is played by the resource value and stability of the country where resources are extracted. It is difficult to forecast the growth prospects in developing countries, which has a negative effect on investment attractiveness and global partnership. The publication notes that private businesses play a prominent part in defining development areas as well as form an attitude to the use of natural resources and final results. One has determined the interrelation between the amount of natural resources and the speed of their degradation, which identifies an indifferent attitude to the ecosystem in case of a great number of natural resources.

In [11], [12], [13] are also examined rational nature management and have concluded that despite Ukraine's post-industrial development and a range of problems, there are tools for solving irrational nature management issues aimed at changing social interests and promoting greening principles.

Vitale [14], Garmendia & Gamboa [15] and others note that there are environmentally dependent diseases that are present only in some areas with the presence of a particular environmental pollution.

Analysis of existing scientific opinions revealed that the strengthening of the role of sustainable development is becoming a competitive advantage and implies the demand for further scientific developments related to the detailed identification of approaches to natural resource management for the strategic development of environmental health.

3. Methodology

This article describes the main directions for the development of methodology for research in the field of sustainable natural resource management. The study proposes a methodology for solving the problem of irrational use of natural resources in Ukraine, which is based on the analysis of the impact of the environmental factor on the health of the population over a long-term period. The article examines the relationship between the growth of well-being with an increase in labour productivity and the duration of working age, as well as irrational use of natural resources, which leads to a decrease in the utility function. The methodological basis of a scientific article on sustainable management of natural resources to ensure the strategic development of environmental health was a combination of general scientific and special methods. The article applies such methods as analysis, abstraction, generalization, induction and deduction, mathematic modelling, comparison, as well as systematically structural and synergetic approaches.

The purpose of the article is to substantiate the features of sustainable management of natural resources to ensure the strategic development of environmental health in Ukraine.

4. Results and Discussion

In modern conditions, the healthcare system acts as the basis for economic growth, which, under the influence of environmental factors, determines the importance of the transition to sustainable natural resource management to minimize the negative impact on the environment.

To implement the rational nature management system in Ukraine, which is at the initial stage because of the declarativity of the decisions and their non-fulfilment, incompliance with environmental legislation and outdated technologies satisfying minimum demands of entrepreneurs and policymakers, corruption and other negative factors, one should define primary tools for adopting resource-saving technologies. One of the methods of resource-saving technologies is waste sorting and reuse of waste.

Initially it is necessary to consider what influences the degree of use of resource-preserving technologies. Primary tools for promoting resource-saving technologies include: rental fee and compensation payments for use and deterioration of natural resources; payment for polluting waste disposal; amount of excise taxes on ecologically dangerous products; benefits and taxes; application of accelerated depreciation of ecologically dangerous equipment and encouragement for integration of resource-saving technologies; development of security deposit, green money, credit relations, ecological insurance and leasing systems; implementation of quotas on hazardous substances emissions; reduction of corruption; development of ecological education and responsibility; availability of government programs and international grants for adoption of resource-saving technologies; monitoring

of the ecosystem current state and constant control over anthropogenic impact, etc.

Innovations are the crucial driving force of development in nature use or environmental management. Currently, Ukraine is establishing funds and social associations that play a significant positive role in efficient integration of cutting-edge technologies. However, the general analysis shows the indifferent attitude to the ecosystem and development due to its worsening. A potential solution for ecosystem preservation issue in the context of human vital activity and market environment is the mutual agreement between economic entities. Considering the situation from the perspective of game theory, one can conclude that parties minimize expenditures and maximize winnings in case of mutual agreement. It is similar to the adoption of green technologies at the state, entrepreneurial and social level [16], [17].

Common agreement, compromises and compliance with statutory rules will enable efficient interaction. Otherwise, one of the parties will enjoy benefits, which is a common situation for profit generation by worsening the ecosystem condition. It is better for counterparties to adhere to the common agreement that is mutually desired but makes each party more potentially vulnerable to damage than when this agreement is absent.

The present requires the shift to resource-saving technologies worldwide but features the speed of transformations in each country primarily because of the different economic situation, the level of stability, mentality and corruption.

One of the research stages is to identify the main problems of Ukraine and the main solutions in the world, based on foreign experience. Shift to green technologies is a complex and quite long process that should be regulated by the state in order to improve the results. One of Ukraine's core problems is shadow economy and heavy corruption. Figure 1. shows the increase in shadow economy in 2014 in Ukraine caused by revolutionary movement, cash outflow, decreased guarantees and investments for implementing resource-saving technologies.

According to Kearney [18] (International consulting group), the volume of global shadow economy is about one trillion dollars. Besides, this figure varies between 8-10% from GDP in developed countries and it is at least 40% of GDP in many countries with the emerging market, although Ukraine has shadow money flows in manufacturing and resource-intensive activities. The level of shadow economy gradually decreased to 32% after 2014 because of the reduction of the Ukrainian territory and the loss of regions with strong economic relations and shadow flows.

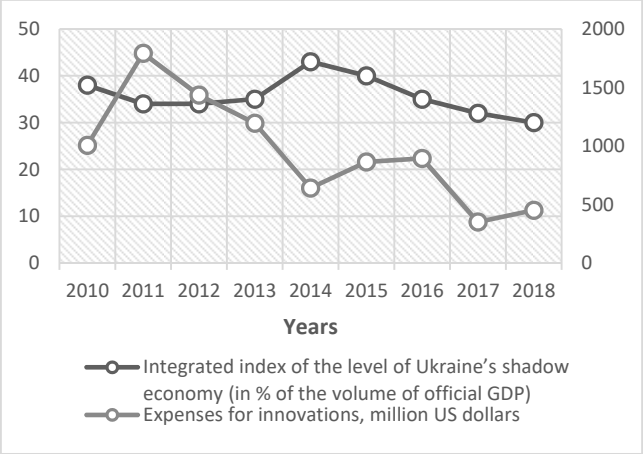

Figure 1. Integrated index of the level of Ukraine's shadow economy and expenses for innovations at the time interval
Source: State statistics service of Ukraine [19].

A significant aspect in the implementation of resource-saving technologies is internal expenses for innovations, scientific advancement and so on. Expenditures for innovations reduced in 2014 due to inflation and economic crisis. Despite increased financing in 2017, Figure 1. shows decreased expenses in further years typical at the long-term interval.

A common phenomenon in Ukraine is relatively major contributions to resource-saving technologies on the part of medium businesses as well as extensive development and integration of breakthrough technologies at state-owned enterprises and in the production industry that causes the greatest negative impact on environment and its constant use.

Inadequate or intentionally changed evaluation of the natural resource potential results in several-fold greater damages because of social indifference, accumulation effect, insufficient financing and participation in state problem solutions. The population of Ukraine is not ready to pay for the introduction of resource-saving technologies while the majority of enterprises are also uninterested, and the state does not create conditions for providing high-quality ecological education, environmental management mechanisms and public access to ecological information. Thus, we can see poor efficiency of the environmental inspectorate and other public authorities due to the high level of corruption and legislative shortcomings.

Planned privatization in 2017-2019 failed to produce proper results. Moreover, some resource-intensive and ecologically dangerous state-owned enterprises still rely on outdated technologies and do not have funds for re-equipment, affecting the quality of the Ukrainian ecosystem.

According to analytical data, Ukraine will require at least 41 years to reach the level of Germany, 34

years to gain the level of France, and 39 years to achieve the level of the majority of EU countries [20].

The above-mentioned factors mean the difficult economic situation and unwillingness of the authorities and the majority of the society to shift to resource-saving technologies [17], [21]. Facing economic challenges, the society frequently puts ecological problems and environmental degradation on the back burner, which aggravates the situation and increases risks for life activities.

Innovation advancement is encouraged by investments and cash flows for the implementation of ecological programs and transformations. Ukraine features the increase in innovatively active enterprises within the increasing market competition, although state-owned enterprises and enterprises with huge production capacity that mostly affect ecology primarily work using Soviet Union technologies and outdated equipment.

Figure 2. depicts the decrease in investments both at the general level and in terms of types of assets aimed at improving the ecological condition. In 2019, we can see the increase in capital investments in environmental improvement. However, it is about 587 US dollars in comparison with 824 million US dollars in 2012. The general trend for the past 10 years shows the decrease in capital investments in manufacturing and temporary closure of government programs, focus on privatization and bankruptcy, as well as liquidation of high-power enterprises.

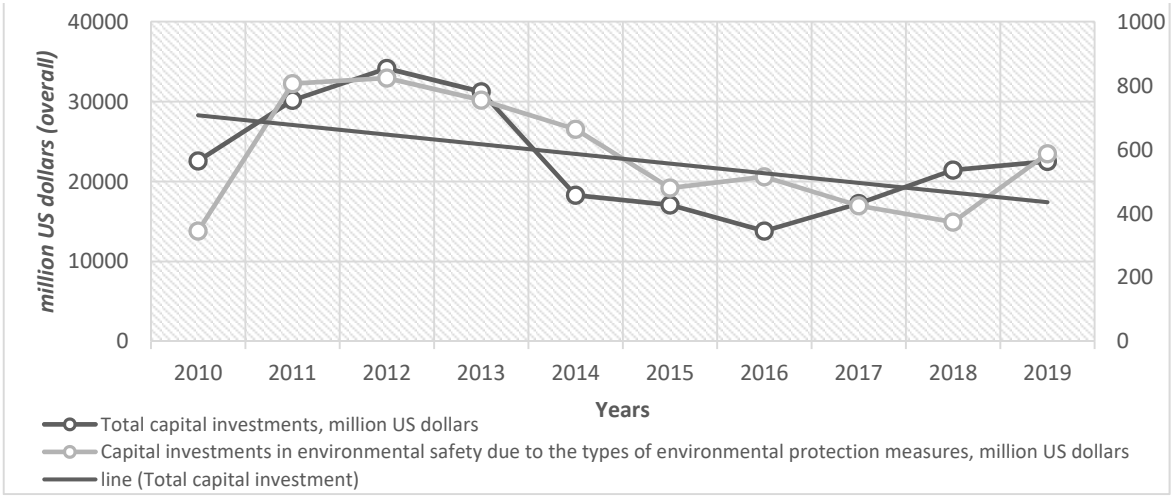

Figure 2. Capital investments at the time interval in Ukraine
Source: State statistics service of Ukraine [19].

However, Ukraine surpasses the economic progress in terms of the Global Innovation Index worldwide and occupies the 45th place with above-average index 36.32 in 2020 [21]. Innovative business activities and involvement of foreign partners are still the general trend in Ukraine. Due to the Global Innovation Index, Ukraine is vulnerable to the following components as shown in Figure 3.

Political environment (44,5; 1050)	Regulatory environment (61; 76)	Business environment (61,2; 104)
• political and operational stability (51,8: 123) • government effectiveness (40,9; 93)	• regulatory quality (36; 88) • rule of law (28; 109) • cost of redundancy dismissal, salary weeks (13,41)	• ease of starting a business (91,1; 52) • ease of resolving insolvency (31,4;117)

Figure 3. Innovation integration index in Ukraine in terms of the most troubled criteria
Source: State statistics service of Ukraine (2019).

The first value in brackets in Fig. 3 depicts a coefficient, its value, the second number means the rating in the list of countries [21]. The most vulnerable aspects in Ukraine, in comparison with the previous years, are political stability, rule of law including increased corruption in the country and ease of resolving insolvency, which also implies an inadequate legislative framework and non-transparent business operations. Nevertheless, these factors are promising for development and can be substantially improved in a short time by well-coordinated work of all governmental and non-governmental authorities. In 2019, Ukraine's innovation integration index was positively affected by research and development solutions, non-regulatory acts, the availability of brand names and patents, as well as the launch of online apps.

The next stage of the article was to identify the most vulnerable points of ecosystem life and draw up a model that would take into account the negative impact of non-ecological technologies on the quality of life of the population.

Disorganized operations of businesses and governing bodies as well as indifference of the majority of population result in additional risks from the ecological perspective and influence living standards of the Ukrainian population. Rational nature management is initially aimed at improving people's living conditions, preserving environment, protecting human health and enhancing the country's economic level. As nature use management affects the ecological situation at the given location and this situation affects human health, which is shown in the morbidity rate, life span, working ability, death rate, etc., we can designate the utility of each individual as *U* that depends on standard factors and the quality of nature use management.

Let *H (h, a)* be a health capital coefficient depending on natural properties of each individual *(a)* and investments in health protection and improvement *(h)*; *B* – a coefficient of individual's capital (wealth, level of richness); *C* – a coefficient of consumption of ecologically friendly goods c_1, c_2,..., c_n; *W(H)* – individual's probability to live up to the pension age; *M(i)* – a coefficient of natural management efficiency depending on investments in ecologically friendly manufacturing and maintenance of environmental quality *(i)*.

$$U = H(h, a) + W(H) * B + C + M(i) \quad (1)$$

Expenses and revenues lead to budget limitations:

$$c_{1\ldots n} * p + h + i + t_k \leq W(H) \quad (2)$$

Where *p* – an actually reasonable price of goods during calculations (beginning of the pension age); $t_к$ – a coefficient of time consumption for health maintenance (in the calculation of hourly payment according to the activity of this individual).

Suppose healthier individuals produce a larger amount of useful goods and services (*U*), which increases the utility function:

$$\frac{dW}{dH} > 0 \quad (3)$$

This dependence shows the increase in individual's wealth when increasing the utility of his/her labour and the duration of working age.

Irrational natural management results in poorer environmental quality that negatively affects individual's health and increases expenditures for health maintenance; worse natural management efficiency factor; and reduced share of consuming ecologically safe goods that decreases the utility function [22]. However, this methodology considers a human being only as a natural resource, labour resource, and the beginning of work incapacity becomes an exit point of the evaluation system.

Let's review investments in human capital in detail. Let *G(t)* be an investment in individual's growth over the period *t*; *m* – expenditure items affecting the social utility function *U*; *N* – the population examined due to a certain age group (*s*).

$$G_m(t, s) = \sum_{N_m} \frac{B_m(t,s)}{\int_{s1,m}^{s2,m} N(t,s)ds} \quad (4)$$

Where *Bm* is a sum of investments in life of a certain individual due to expenditure items. Primary investments *Bm* include investments in healthcare (*h*), investments in education (*o*), investments in culture and spiritual growth (*d*), investments in environment protection and safety, creation of ecological and comfortable living conditions (*i*), other investments in individual's advancement (*x*). So, the sum of investments in life of a certain individual within the given period can be calculated using the formula:

$$B_m = \sum_{t_0}^{t_n}(h + o + d + i + x) \quad (5)$$

This methodology allows us to calculate investments in the life of citizens of different countries and different age group as well as to compare sums of investments, which will show the quality of population life.

The fourth stage of the study was to determine the main directions of the country's development to improve the situation that has developed and make recommendations for future development, taking into account the experience of developed countries. With the ecological state of environment having correlation with morbidity rates and life duration of citizens according to previous articles [23], natural resource management should be implemented at the micro-level and should become an integral part of government programs and the framework for businesses.

Key stages of implementing rational nature management for enterprises should include [24], [25]: planning and correction of all parameters in order to protect the environment and adopt the rational use of natural resources; coordination and close relations with other enterprises to reduce the negative ecological impact; motivation for all employees, population, public organizations and state-owned enterprises to integrate resource-saving technologies; constant diagnostics, monitoring and control of each system element, creation of monitoring groups and control systems with independent experts who will change every month in order to improve the control over ecological legislation fulfilment and will be appointed by each division of the business structure or state-owned institution on a voluntary basis; establishment of the open database for each enterprise or institution with the specified activity area, potential ecological risks, economical parameters that show the contribution to resource-saving technologies in order to reduce the ecological burden.

The availability of open data on the website or webpage of each company allows conducting public control on the Internet using satellite communication and locally, which will decrease the negative ecological impact and encourage entrepreneurs to integrate innovations. One of the elements of implementing rational nature management should be education that prioritizes ecological problems and long-term planning and only then analyses profit and other economic aspects [26], [27].

A common phenomenon in Ukraine is the availability of ecological problems and accumulation of negative effects over the years, which can be solved using the following methodology (Figure 4.).

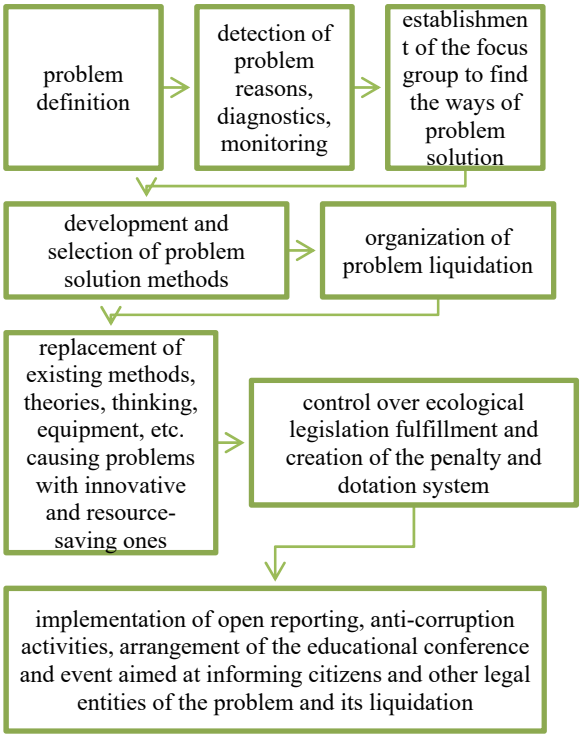

Figure 4. Method for solving the issue of irrational natural resource use in Ukraine

To improve the ecological situation at the macro-level and reduce the ecological burden, one should provide a favourable investment climate in the country and regions by ensuring investment attractiveness, enhancing economic and political stability, guarantees, free access to information, preventing corruption, introducing a differential tax to indicate an ecological component and encourage innovations, as well as by forming ecological thinking of each individual.

Analysing the impact of the ecological factor on public health at the long-term time interval, we can make a conclusion about the close relation between these parameters [28]. Therefore, one should take into account the mutual influence of environment and people and natural management principles while developing the healthcare strategy.

The healthy and employable population defines country's life necessities, economic potential and GDP increase, thus natural resource management is a significant step towards the improvement of Ukraine's economic, ecological and social system [29]. Further development of the healthcare system affecting social behaviour strategies should include the following aspects:

1. Constant correction of all elements of the healthcare system and ecological situation that affects its functioning (especially according to regions), monitoring of the current situation and control over data transparency, which will improve social parameters, increase life duration, decrease death and morbidity rates.
2. Increase in treatment affordability, eco-friendly products and the possibility to get immediate aid for free at healthcare facilities.
3. Increase in the number of healthcare institutions, prompt responding and state financial support for all healthcare employees.
4. Improvement of volumes and mechanisms of financing healthcare and ecological areas.
5. Optimization of labour resources, training for young specialists in a desired number and with necessary medical and ecological knowledge.
6. Better access to information and further development areas in healthcare and ecology.
7. Advancement of the legal framework, in particular, better functioning of green economy and efficiency of the healthcare sector.
8. Development of international cooperation, training for socially and ecologically responsible staff.
9. Integration of the system for helping those failing to take care of themselves and environment.
10. Greater impact of society on the activity of authorities and businesses in order to implement rational nature management.
11. Introduction of the system aimed at ecological education and responsibility for the ecosystem and future.
12. Promotion of innovative methods for solving challenging issues related to ecology and rational nature management.

Each person is an open system that constantly interacts with environment and can significantly increase the labour resource by improving health and comfortable living conditions. Responsibility for manufacturing or entrepreneurial activities and control over the impact on the ecosystem should be not only institutional, public and monitored by special authorities, but it also should become a background for human views and principles.

Constant occurrence of new threats, the majority of which are caused by the anthropogenic factor, makes the world dynamic and requires rapid solutions. Therefore, natural resource management should rely on the responsibility for consequences of any activity in order to improve Ukraine's overall public health and GDP, reduce expenses for health maintenance in case of losing the ability to work, and enhance the living standards of the citizens.

Since there is a very large percentage of the shadow economy in Ukraine, financial resources do not reach the final goal, therefore, health care in Ukraine is at a poor level. All recent reforms were carried out to develop private medicine, which is inaccessible to most citizens of Ukraine. The money that each person invests in maintaining his ability to work can bring profit to entrepreneurs and the state. Therefore, every entrepreneur must take care of the working capacity of his employees, create better conditions for them, and monitor the quality of the environment. The responsibility of every entrepreneur can improve the overall situation. But this is possible only with good education and cultural level, understanding of responsibility. To do this, it is necessary to form environmental education and values for every citizen from childhood. These tasks are now entrusted to the state, therefore, it is necessary to strengthen control over the quality of entities and financial flows.

In the future, it is planned to study the responsibility of businessmen in Ukraine for the state of the environment and test a model that takes into account investment in education and health care, as well as the state of the ecosystem in people of different age categories.

5. Conclusions

One of Ukraine's core problems nowadays is the increase in anthropogenic burden and application of outdated technologies, which is ecologically dangerous and has negative performance indicators in terms of the ecological factor. Ukraine cannot minimize risks and extensively advance without the implementation of rational nature management based on the integration of green technologies and reduction of corruption and shadow economy. This strategy is efficient only in case of changing social values and realizing the responsibility for actions that have negative consequences and can affect public health.

It has been found that in areas with a high environmental load, there is an increase in morbidity, which leads to disability and increased costs for improving health.

Advancement of individual's wellness enhances his/her utility function due to better working capability, which also affects macroeconomic performance. Besides deterioration of life quality, the poor ecological situation affects agricultural products that can result in higher morbidity rates and loss of the ability to work as well as increase investments in health maintenance for each individual. It can be beneficial to pharmaceutical companies and agricultural enterprises aiming to obtain maximum profit in a short-term perspective, but it has negative consequences in the long-term period along with the accumulative effect.

It has been established that the more money you invest in the education of people and the more principles of love for the environment, care for living things, cultural values you give to a person, the more responsibility such people have. The principle of the formation of ecological thinking begins in childhood. A promising and priority task for Ukraine now is the elimination of corruption, the formation of a responsible and healthy society, as well as caring for the ecosystem and improving the quality of life.

The natural management efficiency factor depends on investments in the development of innovative and eco-friendly technologies. It is especially important for industrial regions with the higher level of anthropogenic burden because of neglecting risk factors caused by the poor ecological state and consumption of products made by large agricultural holding companies that use a great amount of chemical substances to speed up the growth of products, produce a lot of semi-finished goods and genetically modified food.

Developing strategies for Ukraine's advancement, one should take into account features of social culture and health in the given region as well as involve communities and population in correction and step-by-step integration of resource-saving technologies in order to increase the responsibility of each individual.

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